

# PATENT ABSTRACTS OF JAPAN

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(54) DURABLE REFLECTION FILM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a durable reflection film having durability, even when exposed to intense UV for a long time and is adaptable even to reduction in weight and size.

SOLUTION: The durable reflecting film is obtained, by successively forming an anchor layer, a silver-vapor-deposited layer and an anticorrosive layer on one face of a substrate comprising a plastic film and disposing a layer of a resin having a UV stable group, and preferably, a UV-absorbing group in its molecule on the other face of the substrate. In order to further enhance durability, a heat ray shielding layer is disposed or an adhesive layer is disposed on the anticorrosive layer, in such a way that the reflection film can be stuck to another substrate by way of the adhesive layer.

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## CLAIMS

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[Claim(s)]

[Claim 1]An anchor layer (B) is formed in one side of a substrate (A) which consists of plastic films, An endurance reflection film providing a resin layer (D) which joins together in a polymer chain and contains an ultraviolet-rays stability group at least in an opposite side of a substrate (A) which forms a silver deposition layer (G) on it, and also forms a corrosion prevention layer (C) on it, and consists of plastic films.

[Claim 2]The endurance reflection film according to claim 1 whose ultraviolet-rays stability group is a basis which has a steric exclusion piperidine skeleton.

[Claim 3]The endurance reflection film according to claim 1 in which a resin layer (D) also contains an ultraviolet absorption nature group further.

[Claim 4]The endurance reflection film according to claim 1 which is the basis which an ultraviolet absorption nature group has a benzophenone skeleton, and has combined in a polymer chain.

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[Translation done.]

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application]In this invention, it is related with the reflector of various lights, the back light reflector of a liquid crystal panel, and the endurance reflection film that can be used for an optical mirror etc. about the endurance reflection film which improved endurance and reflectance.

Therefore, it is related with an endurance reflector suitable for the back light reflector etc. which are especially used under an elevated temperature and high intensity ultraviolet rays.

[0002]

[Description of the Prior Art]That in which the conventional reflector polished the aluminum plate and the stainless plate, and the thing which vapor-deposited metal thin films, such as direct aluminum and silver, to the plastic film are used.

[0003]

[Problem(s) to be Solved by the Invention]However, what polished the aluminum plate which is the conventional reflector, and the stainless plate, and the thing of photoluminescence which vapor-deposited aluminum directly to the plastic sheet are [ reflectance ] low insufficient, and there was a problem in endurance. Although reflectance is higher than that in which what vapor-deposited silver directly to the plastic film polished the aluminum plate and the stainless plate, and the thing which vapor-deposited aluminum directly to the plastic sheet, it has not resulted in the reflectance which the commercial scene is demanding. There is a problem in endurance, such as a fall of the adhesion power between a plastic film and a silver deposition layer, corrosion of a silver deposition layer, and a hue change by light, by temporality, and the satisfying endurance reflection film is not obtained to the physical properties as which all are demanded. Reinforcement of a cold cathode tube and the miniaturization of a back light unit progress, and ultraviolet rays hit a reflector strongly, and lighting times have long-time-ized in recent years. Therefore, although the trial which uses the film which coated the film plane with the plastic film and ultraviolet ray absorbent which scoured an ultraviolet ray absorbent, UV stabilizer, etc., UV stabilizer, etc. as a substrate of a reflector is also made, Even if it has an adverse effect on the gloss characteristics as a reflector or endurance improves to weak ultraviolet rays, when ultraviolet rays hit strongly at an elevated temperature for a long time, This ultraviolet ray absorbent and UV stabilizer carried out bleed out, and the thing insufficient for endurance reflectors, such as color fastness, crack resistance, and blister-proof

nature, was almost the case.

[0004]Therefore, the thing in which the purpose of this invention polished a conventional aluminum plate and stainless plate, It is in providing the endurance reflection film which solved all the above-mentioned technical problems that the reflector which vapor-deposited metal thin films, such as direct aluminum and silver, to the plastic film, and the reflector which vapor-deposited metal thin films, such as silver, to the plastic film of ultraviolet-rays interception nature were held, and was excellent.

[0005]

[Means for Solving the Problem]This invention forms an anchor layer (B) in one side of a substrate (A) which consists of plastic films, Form a silver deposition layer (G) on it, and also a corrosion prevention layer (C) is formed on it, It is an endurance reflection film providing a resin layer (D) which joins together in a polymer chain and contains an ultraviolet-rays stability group at least in an opposite side of a substrate which consists of plastic films, an ultraviolet-rays stability group being a certain aforementioned endurance reflection film which has a sterically-hindered piperidine skeleton, and, It is the aforementioned endurance reflection film which is the basis which a resin layer (D) is the aforementioned endurance reflection film which also has an ultraviolet absorption nature group further, and an ultraviolet absorption nature group has a benzophenone skeleton further again, and has furthermore been combined in a polymer chain.

[0006]By having had the above-mentioned composition, a durable reflection film which solved a technical problem which the conventional reflection film was holding can be made.

[0007]

[Embodiment of the Invention]As a substrate (A) which consists of a plastic film in the endurance reflection film of this invention, If there is lightfastness by high transparency, there will be no restriction in particular, but, for example An acrylic film, A polycarbonate film, a polyarylate film, a polyethylenenaphthalate film, A polyethylene terephthalate film, a fluorine film, etc. are preferred, What coated the surface with the resin which surface treatments, such as \*\*\*\*\*, easy sliding, prevention from electrification, a corona, and saponification, were performed, and also scoured the ultraviolet ray absorbent in order to raise lightfastness, or mixed the ultraviolet ray absorbent may be sufficient as all. Although there is no restriction in particular about the thickness, the range of 6-300 micrometers is usually preferred. Intensity runs short in less than 6 micrometers, a wrinkle is not generated at processes, such as coating of resin, or thickness is inferior to workability and is not preferred. On the other hand, if thickness exceeds 300 micrometers, intensity is too strong, and it is inferior to the rolling-up nature in the coating of resin, etc., and cost goes up, and it is not economical from a point of a material cost, and practical except for the case of being special. Such film thickness is 12-40 micrometers more preferably, considering the purpose as a reflector of the miniaturization of this invention, and a weight saving. In a plastic film (A), a polyethylene terephthalate film is the most desirable film from viewpoints of heat resistance, transparency, economical efficiency, etc. as these substrates.

[0008]As an anchor layer (B) adopted as the endurance reflection film of this invention, If it is resin which is durable by high transparency and raises reflectance, there will be no restriction in particular, but. The paints, ultraviolet curing nature thermoplastics, thermosetting resin, electron beam hardening resin, or resin etc., For example, an amino resin, an amino alkyd resin, acrylic resin, An acrylic styrene copolymer, polyester system resin, VCM/PVC system resin, Vinyl acetate system resin, a polyvinyl butyral, urethane system resin, urea system resin, The resin which consists of independence, such as melamine system

resin, urea-melamine system resin, epoxy system resin, fluororesin, polycarbonate, a nitrocellulose, cellulose acetate, an alkyd resin, rosin denaturation maleic acid resin, and polyamide system resin, or these mixtures is used. The above-mentioned resin may use an organic polymer and a copolymer as the main ingredients, and may contain additive agents, such as a plasticizer, stabilizer, and an ultraviolet ray absorbent.

[0009]Said anchor layer (B) the paint which diluted said anchor resin with the solvent on one side of said substrate The gravure coating method, It applies and dries with the usual coating methods, such as the reverse-roll-coating method, the roll coating method, and a dip coating method (in the case of hardening resin, it hardens), and is formed. The thickness of an anchor layer (B) is suitably chosen from the range which is usually about 0.01-3 micrometers, although there is no restriction in particular. Thickness cannot cover the surface of said substrate with less than 0.01 micrometer uniformly, even if the effect of giving endurance and the improvement in reflectance cannot fully demonstrate, but there is no value in which the anchor layer (B) was formed and it exceeds 3 micrometers on the other hand, the drying rate of an anchor layer becomes slow and is not inefficiently and economically preferred.

[0010]As a silver deposition layer (G) in the endurance reflection film of this invention, it is formed by the film production methods, such as a vacuum deposition method, sputtering process, and the ion plating method. The thickness of a silver deposition layer (G) is suitably chosen from the range which are usually 20 nm - about 200 nm, although there is no restriction in particular. The tendency for the further improvement in reflectance not to be found, but to gain in the internal stress of a silver deposition layer (G), and for adhesion strength with an anchor layer (B) to fall even if reflectance of thickness is bad and it exceeds 200 nm on the other hand in less than 20 nm is shown, Since it is inferior to workability and the amount of silver [ used ] also increases as the quantity of heat which a substrate receives at the time of vacuum evaporation increases, it is economically inferior and is not desirable. As a silver deposition layer (G) in this invention, although virgin silver is adopted, it is a range which does not spoil reflectance for the improvement in weatherability (oxidation resistance, sulfuration-proof nature, etc.), and what mixed or alloyed other metal may be adopted.

[0011]Especially as a corrosion prevention layer (C) in the endurance reflection film of this invention, it is not restricted, for example, the paints, ultraviolet curing nature thermoplastics, thermosetting resin, electron beam hardening resin, or resin etc., are also used. For example, an amino resin, an amino alkyd resin, acrylic resin, styrene resin, An acrylic styrene copolymer, urea-melamine system resin, epoxy system resin, The plastic paint which consists of independence, such as fluororesin, polycarbonate, NITORU cellulose, cellulose acetate, an alkyd resin, rosin denaturation maleic acid resin, and polyamide system resin, or these mixtures is used.

[0012]Said corrosion prevention layer (C) the paint which diluted said corrosion prevention layer resin with the solvent all over the silver deposition layer side of the substrate in which the aforementioned silver deposition layer was formed The gravure coating method, It applies and dries with the usual coating methods, such as the roll coating method and a dip coating method (in the case of hardening resin, it hardens), and is formed. The thickness of a corrosion prevention layer (C) is suitably chosen from the range which is usually about 0.5-5 micrometers, although there is no restriction in particular. Thickness cannot cover uniformly the surface of said substrate and a metal deposition layer (silver deposition layer) with less than 0.5 micrometer, The effect in which the corrosion prevention layer (C) was formed cannot

fully demonstrate, but there is no value in which the corrosion prevention layer (C) was formed, even if it exceeds 5 micrometers on the other hand, there is no big difference in the effect of a corrosion prevention layer (C), the drying rate of a corrosion prevention layer (C) becomes slow, and since it is inefficient, it is not desirable. To give concealment nature and accumulation divergence to this corrosion prevention layer. To the plastic paint for corrosion prevention layers, a mat-ized agent, for example, barium sulfate, barium carbonate, What carried out mixture dispersion of the metal powder, such as extenders, such as calcium carbonate, gypsum fibrosum, titanium oxide, silicon oxide, an alumina hydrate, a silica white, TAKURU, a calcium silicate, and magnesium carbonate, aluminium powder, a brass powder, and copper powder, etc. beforehand can be used. Although there is no restriction in particular about the size of the particles of a mat-ized agent, the range which are 0.001 micrometer - about 5 micrometers which does not have trouble in coating is desirable.

[0013]In order to carry out polymerization lamination of the durable reflection film of this invention to other substrates in the durable reflection film of this invention, an adhesives layer may be provided on a corrosion prevention layer. not being restricted especially as this adhesives layer -- both [ for example, ] a dry laminate agent, a wet lamination agent a binder a heat-sealing agent a hot melt agent, etc. -- although - it is used. For example, polyester system resin, urethane system resin, polyvinyl acetate system resin, acrylic resin, nitrile rubber, etc. are used. As for especially a laminating method, it is preferred from a point of economical efficiency and productivity for it not to be restricted, for example, to carry out continuously by a roll formula. Adhesives layer thickness is usually chosen from the range of about 1-50 micrometers. If adhesion effect with thickness sufficient at less than 1 micrometer is not acquired but it exceeds 50 micrometers on the other hand, an adhesives layer is too thick, and a drying rate becomes slow and it is inefficient. And since the evil of original adhesive strength not being obtained but a solvent remaining arises, it is not desirable.

[0014]It is stuck with the durable reflection film of this invention suitably adopted as this invention, and also as a substrate, The protection nature of a silver deposition layer can be given and what is necessary is For example, an acrylic film or a sheet, [ just ] A polycarbonate film or a sheet, a polyarylate film, or a sheet, A polyethylenenaphthalate film or a sheet, a polyethylene terephthalate film, or a sheet, Plastic films, such as a fluorine film, a sheet, or titanium oxide, The plastic film or sheet which coated the resin which scoured the plastic film or sheet which scoured silica, aluminium powder, copper powder, etc., and these, or performed surface treatment, such as metal deposition, is used. The thickness of a lamination film or a sheet is chosen from the range which is usually 12-250 micrometers, although there is no restriction in particular. thickness has a problem in respect of laminating operation in less than 12 micrometers, and is not preferred -- when it exceeds 250 micrometers on the other hand, the waist of a film is strong, and since a problem arises in a work plane or economical efficiency, it is not desirable. It may make it simultaneous to fabricate these other substrates so that it may stick after providing a crevice and heights before pasting together to the durable reflection film of this invention, it may fabricate so that it may have a crevice and heights after sticking, and it may have lamination, a crevice, and heights.

[0015]As a resin layer (D) in this invention which joins together in a polymer chain and contains an ultraviolet-rays stability group at least, For example, it is a resin layer which joins together in a polymer chain and contains a sterically-hindered piperidine skeleton, For example, 2, 2, 6, and 6-tetramethylpiperidine residue, The layer of the resin which joins together in a polymer chain and contains

the residue of the polymerization nature monomer which has 2, 2 and 6, such as 4-(meth)acryloyloxy 2, 2, and 6 and 6-tetramethylpiperidine residue, and 6-tetramethylpiperidine skeleton is mentioned, Although not limited in particular, the UV-G714 grade by NIPPON SHOKUBAI Co., Ltd. is mentioned, for example. As a resin layer (D) which joins together in a polymer chain and contains this ultraviolet-rays stability group, What has a benzophenone skeleton as this ultraviolet absorption nature group with which the effect of way which also made the ultraviolet absorption nature group hold in the above mentioned ultraviolet-rays stability Motoyasu owner resin of this invention improves further is preferred, and what this benzophenone skeleton has combined in a polymer is preferred. [0016]In this invention, in order to improve the endurance of a reflector further, a heat ray filter layer may be provided. That the publicly known metallic thin film layer by vacuum evaporation etc. and an inorganic compound thin film layer are independent as this heat ray filter layer, or the heat ray filter layer of a layered product, Although there are especially a heat ray filter layer etc. which carried out spreading formation of the plastic paint containing a heat ray interception nature agent and it is not limited, the heat ray filter layer which carried out spreading formation of the plastic paint which contains a heat ray interception nature agent from points, such as economical efficiency and heat ray interception nature, is preferred. Formation of this heat ray filter layer may be formed in which position of on the resin layer (D) which has an ultraviolet-rays stability group, the bottom, on a corrosion prevention layer (C), or the bottom. As a heat ray interception nature agent which uses the plastic paint containing a heat ray interception nature agent for the heat ray filter layer which carried out spreading formation, Tin oxide, an antimony tin system oxide (ATO), an indium tin system oxide (ITO), Inorganic oxides, such as vanadium oxide, or other inorganic conductive oxides, Although organic system heat ray interception nature agents, such as inorganic system particle heat ray interception nature agents, such as a conductive sulfide, conductive carbide, and a conductive nitride, a phthalocyanine system compound, a chromium cobalt complex salt thiol, a nickel complex, the Anthraquinone system compound, can use it suitably, At the point which is excellent in transparency and has heat ray cutoff performance with it. [ high and visible light transmissivity and ] [ high ] It is the combination (that whose rate of the organic system heat ray interception nature agent in the inside of the combination body is 0.1 to 30 % of the weight is more preferred) of an organic system heat ray interception nature agent and an inorganic system heat ray interception nature agent, and 0.5 micrometer or less, it is still more desirable and a thing of 0.1 micrometer or less has the first [ an average of ] preferred particle diameter. Although an example is given to below and a high durability reflection film is explained to it in detail, it is not restricted to this.

[0017]

[Example]As a resin layer (D) which has an ultraviolet-rays stability group on one side of the substrate (A) which consists of a polyethylene terephthalate film with an example 1 thickness of 25 micrometers, Spreading desiccation of the UV-G714 by NIPPON SHOKUBAI Co., Ltd. which carries out joint possession of the sterically-hindered piperidine residue into resin was carried out, and the 1-micrometer-thick resin layer (D) was formed. Apply a polyester system resin system paint to the opposite side in which the resin layer (D) which has this ultraviolet-rays stability group was formed, and it dries, Form a 1-micrometer-thick anchor layer (B), and on this anchor layer, carry out vacuum deposition of the silver and an 80-nm-thick silver deposition layer (G) is formed, Subsequently, spreading desiccation of the melamine epoxy resin coating (titanium oxide addition) was carried out the whole surface on a silver deposition layer, the 1.5-micrometer-thick corrosion prevention layer (C) was formed, and the endurance reflection film of this

invention was obtained.

[0018]As a resin layer (D) which has an ultraviolet-rays stability group on one side of the substrate which consists of a polyethylene terephthalate film which scoured the ultraviolet ray absorbent with an example 2 thickness of 25 micrometers, Spreading desiccation of the UV-G714 by NIPPON SHOKUBAI Co., Ltd. which carries out joint possession of the sterically-hindered piperidine residue into resin was carried out, and the 1-micrometer-thick resin layer (D) was formed. Apply a polyester system resin system paint to the opposite side in which this resin layer (D) was formed, and it dries, Form a 1-micrometer-thick anchor layer, and on this anchor layer, carry out vacuum deposition of the silver and an 80-nm-thick silver deposition layer is formed, Subsequently, spreading desiccation of the melamine epoxy resin coating (titanium oxide addition) was carried out the whole surface on a silver deposition layer, the 1.5-micrometer-thick corrosion prevention layer was formed, and the endurance reflection film of this invention was obtained.

[0019]As a resin layer (D) which has an ultraviolet-rays stability group on one side of the substrate which consists of a polyethylene terephthalate film which scoured the ultraviolet ray absorbent with an example 3 thickness of 25 micrometers, Spreading desiccation of the UV-G300 by NIPPON SHOKUBAI Co., Ltd. which carries out joint possession of the sterically-hindered piperidine residue into resin was carried out, and the 1-micrometer-thick resin layer (D) was formed. Apply a polyester system resin system paint to the opposite side in which this resin layer (D) was formed, and it dries, Form a 1-micrometer-thick anchor layer, and on this anchor layer, carry out vacuum deposition of the silver and an 80-nm-thick silver deposition layer is formed, Subsequently, spreading desiccation of the melamine epoxy resin coating (titanium oxide addition) was carried out the whole surface on a silver deposition layer, the 1.5-micrometer-thick corrosion prevention layer was formed, and the endurance reflection film of this invention was obtained.

[0020]On one side of the substrate which consists of a polyethylene terephthalate film which scoured the ultraviolet ray absorbent with a comparative example 1 thickness of 25 micrometers. Apply a polyester system resin system paint, dry, and a 1-micrometer-thick anchor layer is formed, On this anchor layer, vacuum deposition of the silver was carried out, the 80-nm-thick silver deposition layer was formed, subsequently to the whole surface on a silver deposition layer spreading desiccation of the melamine epoxy resin coating (titanium oxide addition) was carried out, the 1.5-micrometer-thick corrosion prevention layer was formed, and the reflection film was obtained.

[0021]<<Evaluation of an invention>> the reflection film obtained by the example and the comparative example, The UEZA meter QUV (Suga Test Instruments Co., Ltd. make DPWL-5R) performed UV irradiation under atmosphere with a temperature of 80 °C from the silver deposition layer forming face [ of the substrate which consists of polyethylene terephthalate films ], and opposite side side, and the reflectance and hue after fixed time lapse were evaluated. Reflectance measured the total reflection factor using Shimadzu Make and spectrophotometers (UV-3100PC), and read Y value. Hue was judged by visual judgment.

[0022]The initial reflectivity of Example 1 was 93%, hue was colorless, the reflectance after a 300-hour exposure was 93%, hue was colorless, the reflectance after a 1000-hour exposure was 89%, and hue was thin yellow. The initial reflectivity of Example 2 was 93%, hue was colorless, the reflectance after a 300-hour exposure was 93%, hue was colorless, the reflectance after a 1000-hour exposure was 93%, and hue



was thin yellow. The initial reflectivity of Example 3 was 93%, hue was colorless, the reflectance after a 300-hour exposure was 93%, hue was colorless, the reflectance after a 1000-hour exposure was 93%, and hue was colorless.

[0023]The initial reflectivity of the comparative example was 93%, hue was colorless, the reflectance after a 300-hour exposure was 85%, hue was thin yellow, and the reflectance of hue after a 1000-hour exposure was brown 69%.

[0024]

[Effect of the Invention]The endurance reflection film of this invention on one side of the base material film (A) which consists of plastic films. By providing an anchor layer (B), a silver deposition layer (G), and a corrosion prevention layer (C) one by one, and providing the resin layer (D) which has an ultraviolet-rays stability group in the opposite side of this base material film. Having pasted together to other substrates via the adhesives layer on the corrosion prevention layer, when a silver deposition layer still needed to be protected, by providing the heat ray filter layer which made the heat ray interception nature agent contain further, etc., Ultraviolet rays and a heat ray became a durable reflection film which is durable as a reflector used for the place irradiated strongly simultaneous again, and it turned out that a durable reflection film effective in a weight saving, a miniaturization, and reinforcement can be provided.

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[Translation done.]